1) (2 points) **Section 6.1** Simplify the radical expression given below.

$$\sqrt{27x^4y^8z^9}$$

$\underbrace{\sqrt{9x^4y^8z^8}}_{\text{PERFECT SQUARES}}\sqrt{3z}$

$\boxed{3x^2y^4z^4\sqrt{3z}}$

2) (4 points) **Section 6.2** Simplify the radical expressions given below.

a) $-2\sqrt[3]{2x^2y^2} \cdot 2\sqrt[3]{15x^5y}$

b) $\dfrac{\sqrt{3xy^2}}{\sqrt{5x^2y^3}}$

a) $-4\sqrt[3]{30x^7y^3} = -4\sqrt[3]{x^6y^3}\ \sqrt[3]{30x}$

$= -4(x^2y)\sqrt[3]{30x} \quad = -4x^2y\sqrt[3]{30x}$

b) $\sqrt{\dfrac{3xy^2}{5x^2y^3}} = \sqrt{\dfrac{3}{5xy}} = \dfrac{\sqrt{3}}{\sqrt{5xy}} \cdot \dfrac{\sqrt{5xy}}{\sqrt{5xy}}$

$= \dfrac{\sqrt{15xy}}{5xy}$

3) (5 points) **Section 6.3** Simplify the radical expressions given below.

a) $\left(2\sqrt{5}+3\sqrt{2}\right)\left(5\sqrt{5}+7\sqrt{2}\right)$

b) $\frac{4+\sqrt{6}}{\sqrt{2}+\sqrt{3}}$

a) $10\sqrt{25}+14\sqrt{10}+15\sqrt{10}+21\sqrt{4}$

$50 + 29\sqrt{10} + 42$

$= 92+29\sqrt{10}$

b) $\frac{4+\sqrt{6}}{\sqrt{2}+\sqrt{3}} \cdot \frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}} = \frac{4\sqrt{2}-4\sqrt{3}+\sqrt{12}-\sqrt{18}}{2-\sqrt{6}+\sqrt{6}-3}$

$= \frac{4\sqrt{2}-4\sqrt{3}+2\sqrt{3}-3\sqrt{2}}{-1}$

$= \frac{\sqrt{2}-2\sqrt{3}}{-1} = 2\sqrt{3}-\sqrt{2}$

4) (5 points) **Section 6.4** Simplify each of the expressions given below.

a) $27^{-\frac{2}{3}}$

b) $\left(x^{\frac{1}{2}}y^{-\frac{2}{3}}\right)^{-6}$

c) $\dfrac{64^{\frac{1}{3}}x^{\frac{2}{3}}y^{-\frac{1}{4}}}{x^{\frac{1}{2}}y^{-\frac{1}{2}}}$

a) $\dfrac{1}{27^{\frac{2}{3}}} = \dfrac{1}{\left(\sqrt[3]{27}\right)^2}$

$= \dfrac{1}{3^2} = \dfrac{1}{9}$

b) $x^{-3}y^{4} = \dfrac{y^4}{x^3}$

c) $4x^{\frac{2}{3}-\frac{1}{2}}y^{-\frac{1}{4}-\left(-\frac{1}{2}\right)}$

$$\boxed{= 4x^{\frac{1}{6}}y^{\frac{1}{4}}}$$

5) (8 points) **Section 6.5** Solve the equation given below.

$$\sqrt{3x+7} + 1 = x$$

$$\sqrt{3x+7} = x - 1$$

$$\left(\sqrt{3x+7}\right)^2 = (x-1)^2$$

$$3x+7 = x^2 - 2x + 1$$

$$x^2 - 5x - 6 = 0$$

$$(x-6)(x+1) = 0$$

$$x = 6, -1$$

$x = -1$ IS EXTRANEOUS
(DOESN'T CHECK)

$$\boxed{x = 6}$$

6) (8 points) **Section 6.6** Let $f(x) = 2x^2 - 3x + 1$ and $g(x) = x - 4$. Find the following

a) $f(g(-3))$

b) $(f \circ g)(x)$

c) $g(f(-1))$

d) $f(x) \cdot g(x)$

e) $\frac{g(x)}{f(x)}$ and list the domain of the result.

a) SINCE $g(-3) = -3 - 4 = -7$, THEN

$$f(g(-3)) = f(-7) = 2(-7)^2 - 3(-7) + 1$$
$$= 98 + 21 + 1 = 120$$

b) $(f \circ g)(x) = f(g(x)) = f(x-4)$

$$= 2(x-4)^2 - 3(x-4) + 1$$
$$= 2(x^2 - 8x + 16) - 3x + 12 + 1$$
$$= 2x^2 - 16x + 32 - 3x + 13$$
$$\boxed{= 2x^2 - 19x + 45}$$

c) $g(f(-1))$ $\quad f(-1) = 2(-1)^2 - 3(-1) + 1 = 2 + 3 + 1 = 6$

$$g(f(-1)) = g(6) = 6 - 4 = 2$$

d) $f(x) \cdot g(x) = \underbrace{(2x^2 - 3x + 1)}_{f(x)}\underbrace{(x - 4)}_{g(x)}$

$$= 2x^3 - 8x^2 - 3x^2 + 12x + x - 4$$
$$\boxed{= 2x^3 - 11x^2 + 13x - 4}$$

e) $\frac{g(x)}{f(x)} = \frac{x-4}{2x^2 - 3x + 1}$

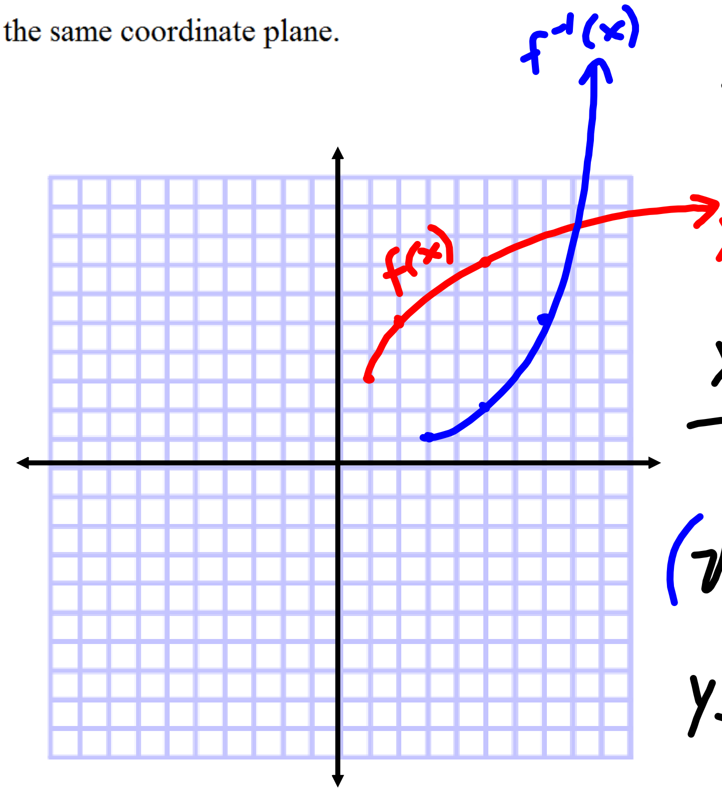
TO FIND DOMAIN, DENOMINATOR CANNOT BE 0.

$$2x^2 - 3x + 1 = 0$$
$$(2x - 1)(x - 1)$$
$$x = \tfrac{1}{2},\ 1$$

SO, DOMAIN:

$$x \neq \tfrac{1}{2},\ 1$$

7) (10 points) **Section 6.7** Let $f(x) = 2\sqrt{x-1} + 3$. Find $f^{-1}(x)$ and graph both $f(x)$ and $f^{-1}(x)$ on the same coordinate plane.



$y = 2\sqrt{x-1} + 3$

$x = 2\sqrt{y-1} + 3$

$\frac{x-3}{2} = \frac{2\sqrt{y-1}}{2}$

$\left(\sqrt{y-1}\right)^2 = \left(\frac{x-3}{2}\right)^2$

$y-1 = \frac{1}{4}(x-3)^2$

$y = \frac{1}{4}(x-3)^2 + 1$

$$\boxed{f^{-1}(x) = \frac{1}{4}(x-3)^2 + 1}$$

DOMAIN $f(x)$: $x \geq 1$

RANGE OF $f(x)$: $y \geq 3$

DOMAIN $f^{-1}(x)$: $x \geq 3$

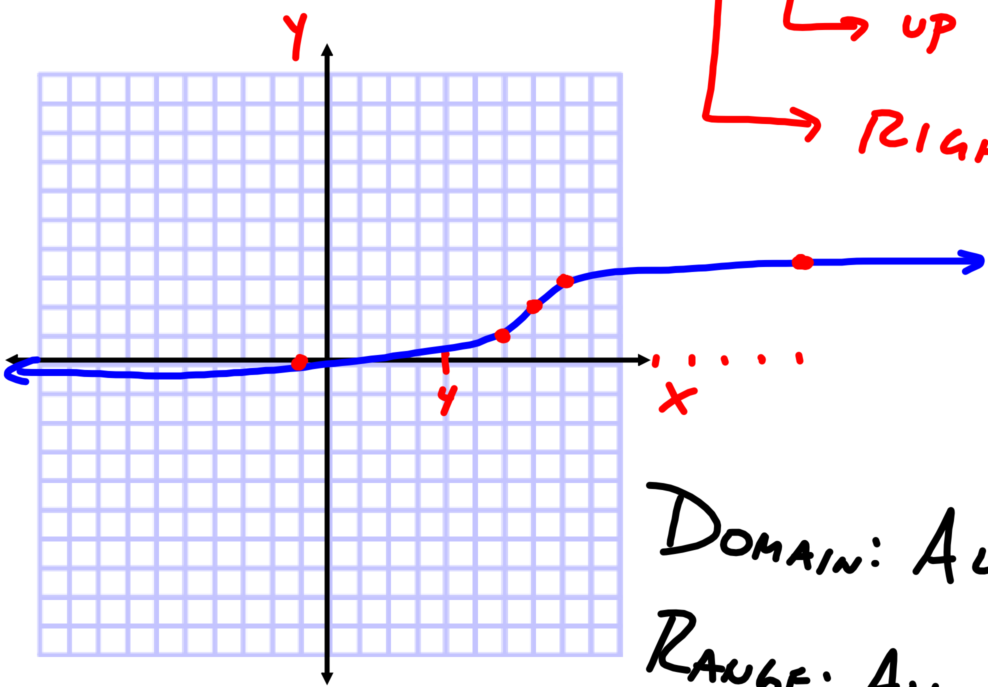
RANGE $f^{-1}(x)$: $y \geq 1$

8) (8 points) **Section 6.8** Graph the function given below. List the domain and the range.

$$f(x) = \sqrt[3]{x-7} + 2$$

UP 2

RIGHT 7



DOMAIN: ALL REALS

RANGE: ALL REALS